

US EPA ARCHIVE DOCUMENT

Salem, Nevine

From: Rachel Pappworth <rpappworth@ses-inc.net>
Sent: Wednesday, May 21, 2014 8:55 AM
To: Salem, Nevine
Subject: RE: Nuevo Midstream - Ramsey Plant
Attachments: G3612 LE -Technical-Specifications.pdf; Engine G3612 - LEHW0041-02 P1.pdf; Section 4 C-15 through C-19 Engine Calcs 043014.xlsx; Section 4 C-20 through C-24 Engine Calcs plus MSS all engines 043014.xlsx; Section 4 C-25 through C-29 Engine Calcs 043014.xlsx; Engine MSS Emission calculations.xlsx

Dear Nevine:

Could you look at this draft response and make sure that I have addressed your comments and questions?

Please note that the revised calculations for the engines lower the CO₂e emissions for the engines, but that they are still a little higher than ones that you calculated based on the generic 40 CFR Subpart 98 calculations.

It was good to talk to you yesterday and discuss your questions and EPA's approach to the use of CCS for part of the amine still vent stream and how to account for periods when, due to situations beyond Nuevo's control, CCS is not available. It is our understanding that there will be "normal operating conditions" when somewhere in the region of 30-35% of the stream (up to 7 MMSCF/D) will be routed to the KM pipeline for CCS purposes. There will also be "Alternate operating conditions" for when and if the Kinder Morgan CSS option is not available, for reasons outside of Nuevo's control, in which case 100% of the amine vent stream will be routed to the RTOs.

The purpose of this email is to respond to the questions that have arisen during your review of the Ramsey GHG PSD permit application and the preparation of the draft permit and statement of basis (SOB). For clarity, your question is provided in bold and Nuevo's response in italics.

Gas Fired Internal Combustion Compressors:

In Ramsey Plant application - P. 14 "low carbon intensity plant residue gas, equivalent to pipeline quality natural gas, was selected as fuel in all on-site combustion equipment".

- **Please provide the source for the emission factors used in the calculations.**

The CO₂ emission factor used was provided by the engine manufacturer. Please see page 3 of the attached LEHW0041 spec sheet, Column 3. The CH₄ emission factor was calculated by subtracting the non-methane hydrocarbon (NMHC) emission rate from the Total Hydrocarbon (THC) emission rate presented on page 1 of the G3612 LE Technical spec sheet. In the application, no reduction was taken for the oxidation catalyst. The calculations have now been revised to take into account the 86% reduction the catalyst will provide (see the attached calculations).

- **Region 6 calculations used emission factors from 40 CFR 98 Table C-2, showed lower CO₂e TPY. Please provide a justification that can be used in the BACT analysis for the higher CO₂e emissions from the residue gas.**

The CO₂ and CH₄ emission factors used are not a generic or industry-wide average, but are specific to the engines planned to be installed. We used the lower CO₂ emission factor provided by the manufacturer for engines of the type and horsepower rating planned to be installed at the facility.

GHG emissions are estimated based on proposed equipment specification as provided by the manufacturer and the default emission factors in 40 CFR Part 98 Subpart C for stationary fuel combustion sources :

CO ₂	53.02 kg/MMBtu	116.89 lb/MMBtu
CH ₄	1.0E-03 kg/MMBtu	2.2E-03 lb/MMBtu
N ₂ O	1.0E-04 kg/MMBtu	2.2E-04 lb/MMBtu

Hourly Emission Rate (lb/hr) = Heat Input Rating (MMBtu/hr) x Emission Factor (lb/MMBtu)

$$= 23.53 \times [(116.89 \text{ CO}_2) + (2.2\text{E-}03 \text{ CH}_4) + (2.2 \text{ E-}04 \text{ N}_2\text{O})]$$

$$= 2750.77 \text{ lb/hr CO}_2 + 0.052 \text{ CH}_4 + 0.0052 \text{ N}_2\text{O}$$

$$\begin{aligned} \text{Hourly CO}_2\text{e emission rate} &= \underline{2753.27 \text{ lb/hr CO}_2\text{e (each engine)}} \\ &= \underline{2753.27 \times 15 = 41,299 \text{ lb/hr (All engines)}} \\ &= 41,299 \times 24 = 991,188 \text{ lb/day} \end{aligned}$$

$$\begin{aligned} \text{Annual Emission Rate (tpy)} &= \text{Hourly Emission Rate (lb/hr)} \times \text{Hours of operation} \\ &\quad (8760 \text{ hr/yr}) \times \text{ton/2,000 lb} \\ &= 12,048 \text{ tpy CO}_2 + 0.228 \text{ tpy CH}_4 + 0.023 \text{ tpy N}_2\text{O} \end{aligned}$$

$$\begin{aligned} \text{Annual CO}_2\text{ e emission rate} &= 12,057.5 \text{ tpy CO}_2\text{ e (per engine)} \\ &= 12,057.5 \text{ tpy} \times 15 = \underline{180,862 \text{ tpy (all engines)}} \end{aligned}$$

$$\begin{aligned} \text{Output based BACT limit /plant} &= \text{Total CO}_2\text{e/output gas processed} \\ &= 991,188 \text{ lb/day/600 MMSCFD} \\ &= \underline{1652 \text{ lb CO}_2\text{ e/MMSCF gas processed}} \end{aligned}$$

- **Why the emission factors used for the Gas Fired Internal Combustion Engines were not used for other combustions equipment (i.e. natural gas emission factors will be used for the heaters)?**

The emission factors that were used for the engines were supplied by the manufacturer and the attached revised calculations are specific to the engines and associated control equipment that will used.

- **Given expected normal operations, what will be the start up time and no. of events/year. (i.e., how many minutes/event and how many times/year).**

We estimated 360 startup/shutdown cycles per year. Start-up emissions are not significantly different from normal operation, but blow down emissions following shutdown were estimated. We estimated 360 blowdown events each lasting 15

minutes and each venting 2,000 scf of fuel. Please see the attached Engine MSS spreadsheet.

- **What will be the method of control for the emissions from the gas fired internal combustion compressors ?**

Oxidation catalyst beds installed on the engine exhaust.

- **Are there any monitoring and record keeping preferences?**

As we discussed, Nuevo will have an opportunity to review and comment on the monitoring and recordkeeping included in the draft permit.

- **Were there any additional GHG emissions associated with the engines Blow Down (BD)?**

Yes. These emissions were estimated and are included in the emission summary table. Please see the attached MSS spreadsheet.

Please do not hesitate to contact me if you have any questions or need any additional information,

Rachel

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From: Salem, Nevine [mailto:Salem.Nevine@epa.gov]
Sent: Tuesday, May 13, 2014 5:33 PM
To: Rachel Pappworth; Wilson, Aimee
Cc: ds@nuevomidstream.com; Robinson, Jeffrey
Subject: RE: Nuevo Midstream - Ramsey Plant

Rachel,

As per our phone call today, please find below all the points we discussed regarding the gas fired internal combustion compressors calculations. Also as discussed, the language for the SOB and permit will include "normal operating conditions" for Nuevo-Ramsey Gas Plant to route 42% (up to 7MMSCF/D) CO2 emission stream from amine still vents to KM pipeline for CCS purposes. The language will also include "Alternate operating conditions" in case out of control condition(s) (pipelines are down, issues with contract, etc.) that will allow Nuevo route 100% CO2 amine still vents emissions to the RTOs for control until out of control issue(s) are resolved.

Gas Fired Internal Combustion Compressors:

In Ramsey Plant application - P. 14 "low carbon intensity plant residue gas, equivalent to pipeline quality natural gas, was selected as fuel in all on-site combustion equipment".

- Please provide the source for the emission factors used in the calculations.
- Region 6 calculations used emission factors from 40 CFR 98 Table C-2, showed lower CO₂e TPY. Please provide a justification that can be used in the BACT analysis for the higher CO₂e emissions from the residue gas.
- GHG emissions are estimated based on proposed equipment specification as provided by the manufacturer and the default emission factors in 40 CFR Part 98 Subpart C for stationary fuel combustion sources :

CO ₂	53.02 kg/MMBtu	116.89 lb/MMBtu
CH ₄	1.0E-03 kg/MMBtu	2.2E-03 lb/MMBtu
N ₂ O	1.0E-04 kg/MMBtu	2.2E-04 lb/MMBtu

$$\begin{aligned}\text{Hourly Emission Rate (lb/hr)} &= \text{Heat Input Rating (MMBtu/hr)} \times \text{Emission Factor (lb/MMBtu)} \\ &= 23.53 \times [(116.89 \text{ CO}_2) + (2.2\text{E-}03 \text{ CH}_4) + (2.2 \text{ E-}04 \text{ N}_2\text{O})] \\ &= 2750.77 \text{ lb/hr CO}_2 + 0.052 \text{ CH}_4 + 0.0052 \text{ N}_2\text{O}\end{aligned}$$

$$\begin{aligned}\text{Hourly CO}_2\text{e emission rate} &= 2753.27 \text{ lb/hr CO}_2\text{e (each engine)} \\ &= 2753.27 \times 15 = 41,299 \text{ lb/hr (All engines)} \\ &= 41,299 \times 24 = 991,188 \text{ lb/day}\end{aligned}$$

$$\begin{aligned}\text{Annual Emission Rate (tpy)} &= \text{Hourly Emission Rate (lb/hr)} \times \text{Hours of operation (8760hr/yr)} \times \text{ton/2,000lb} \\ &= 12,048 \text{ tpy CO}_2 + 0.228 \text{ tpy CH}_4 + 0.023 \text{ tpy N}_2\text{O}\end{aligned}$$

$$\begin{aligned}\text{Annual CO}_2\text{ e emission rate} &= 12,057.5 \text{ tpy CO}_2\text{ e (per engine)} \\ &= 12,057.5 \text{ tpy} \times 15 = \underline{180,862 \text{ tpy (all engines)}}$$

$$\begin{aligned}\text{Output based BACT limit /plant} &= \text{Total CO}_2\text{e/output gas processed} \\ &= 991,188 \text{ lb/day/600 MMSCFD} \\ &= \underline{1652 \text{ lb CO}_2\text{ e/MMSCF gas processed}}\end{aligned}$$

- Why the emission factors used for the Gas Fired Internal Combustion Engines were not used for other combustions equipment (i.e. natural gas emission factors will be used for the heaters)?
- Given expected normal operations, what will be the start up time and no. of events/year. (i.e., how many minutes/event and how many times/year).
- What will be the method of control for the emissions from the gas fired internal combustion compressors ?
- Are there any monitoring and record keeping preferences?
- Were there any additional GHG emissions associated with the engines Blow Down (BD)?

Please feel free to contact me with any questions.

Regards,

Nevine Salem

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From: Rachel Pappworth [<mailto:rpappworth@ses-inc.net>]
Sent: Tuesday, May 13, 2014 4:40 PM
To: Salem, Nevine; Wilson, Aimee
Cc: ds@nuevomidstream.com; Robinson, Jeffrey
Subject: Re: Nuevo Midstream - Ramsey Plant

Dear Nevine and Aimee:

When would be a good time to call to get your input on how to handle the RTO/CCS question?

Thanks
Rachel
Sent from my iPhone

On May 12, 2014, at 11:27 AM, "Robinson, Jeffrey" <Robinson.Jeffrey@epa.gov> wrote:

Dwight and Rachel:

I wanted to inform you that we've discussed the original Nuevo Midstream Ramsey Plant application with technical staff at EPA's Office of Air Quality Planning Standards who review all GHG permits prior to their proposal that EPA Region 6 prepares. They have provided us feedback on the permit application and an indication of their preference for how this Region 6 prepares the draft permit with respect to CCS vs. RTO approach. I would suggest that you contact Nevine and Aimee to discuss, or feel free to call me to discuss.

Jeff Robinson, Section Chief
Air Permits Section
EPA Region 6
214-665-6435

**ESTIMATED CO₂e POTENTIAL TO EMIT (PTE) EMISSIONS USING
VENDOR DATA AND 40 CFR 98 EMISSION FACTORS**

Facility: Ramsey Gas Plant

Unit Description		Rating	Heat Input			Emission Factors		
Gas-Fired Compressor Engines		hp	Fuel Factor	Hours of Operation	Maximum (MMBtu /yr)	CO ₂	CH ₄	N ₂ O
			Btu/bhp-hr			g/bhp-hr ¹	g/bhp-hr ²	kg/MMBtu ³
C-15	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-16	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-17	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-18	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-19	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04

EMISSIONS

	CO ₂	CH ₄	N ₂ O	CO ₂ e	CO ₂	CH ₄	N ₂ O	CO ₂ e
	lbs/hr	lbs/hr	lbs/hr	lbs/hr	TPY	TPY	TPY	TPY
C-15	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-16	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-17	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-18	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-19	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
				TOTAL	17,920 lbs/hr		TOTAL	78,490 TPY

1 Vendor Data

2 Vendor Data including the reduction from the oxidation catalyst

3 40 CFR 98 Table C-2 Emission Factor

**ESTIMATED CO₂e POTENTIAL TO EMIT (PTE) EMISSIONS USING
VENDOR DATA AND 40 CFR 98 EMISSION FACTORS**

Facility: Ramsey Gas Plant

Unit Description		Rating	Heat Input			Emission Factors		
Gas-Fired Compressor Engines		hp	Fuel Factor	Hours of Operation	Maximum (MMBtu /yr)	CO ₂	CH ₄	N ₂ O
			Btu/bhp-hr			g/bhp-hr ¹	g/bhp-hr ²	kg/MMBtu ³
C-20	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-21	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-22	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-23	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-24	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04

EMISSIONS

	CO ₂	CH ₄	N ₂ O	CO ₂ e	CO ₂	CH ₄	N ₂ O	CO ₂ e
	lbs/hr	lbs/hr	lbs/hr	lbs/hr	TPY	TPY	TPY	TPY
C-20	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-21	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-22	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-23	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-24	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
	TOTAL			17,920 lbs/hr		TOTAL	78,490 TPY	

1 Vendor Data

2 Vendor Data including the reduction from the oxidation catalyst

3 40 CFR 98 Table C-2 Emission Factor

ESTIMATED CO₂e POTENTIAL TO EMIT (PTE) EMISSIONS USING MANUFACTURER DATA AND 40 CFR 98 EMISSION FACTORS

Facility: Ramsey Gas Plant

Unit Description		Rating	Heat Input		Emission Factors			
Gas-Fired Compressor Engines		hp	Fuel Factor	Hours of Operation	Maximum (MMBtu /yr)	CO ₂	CH ₄	N ₂ O
			Btu/bhp-hr			g/bhp-hr ¹	g/bhp-hr ²	kg/MMBtu ³
C-25	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-26	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-27	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-28	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04
C-29	3612 LE	3,550	6,629	8760	206,149	439	0.75	1.00E-04

EMISSIONS

	CO ₂	CH ₄	N ₂ O	CO ₂ e	CO ₂	CH ₄	N ₂ O	CO ₂ e
	lbs/hr	lbs/hr	lbs/hr	lbs/hr	TPY	TPY	TPY	TPY
C-25	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-26	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-27	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-28	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
C-29	3,436	5.87	0.005	3,584	15048.5	25.71	0.023	15,698
	TOTAL			17,920 lbs/hr		TOTAL	78,490 TPY	

1 Vendor Data

2 Vendor Data including the reduction from the oxidation catalyst

3 40 CFR 98 Table C-2 Emission Factor